

# **THE ECONOMIC BURDEN OF CHRONIC OBSTRUCTION PULMONARY DISEASE DUE TO SMOKING**

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**OBJECTIVES:** Smoking is one of the leading causes to develop chronic obstruction pulmonary disease (COPD). The economic burden of COPD inflicted by smoking remains unclear. The goal of this study is to estimate cost of COPD-related health care services consumed by the smokers, in comparison with that consumed by the non-smokers. **METHODS:** The Markov model was constructed to simulate incidence and progression of COPD and to estimate cost of health care services consumed by COPD patients over a 25-year time period. The analysis was restricted to males aged 50–54 years. The cohort of subjects in the model was derived from the NHANES 2005–06 dataset. Based on the number of cigarette consumption, the subjects were categorized into four groups: non-smokers, light smokers, moderate smokers, and heavy smokers. COPD severity was classified into three stages, based on GOLD criteria (I, II, III/IV). **RESULTS:** In comparison with the three smoking groups, the non-smoking group had the lowest average annual COPD-related health care services cost per person, \$821 and the longest average survival period per person, 17.23 years. With the non-smoking group serving as the baseline group, the incremental COPD-related health care services cost of the light smoking group, the moderate smoking group, and the heavy smoking group was \$546, \$681, and \$2127 per person, but incremental survival of each group was –0.01, –0.05, and –0.16 year, respectively. The average annual COPD-related health care services cost consumed by the non-smokers, the light smokers, the moderate smokers, and the heavy smokers in the age of 50 to 54 years was \$146,121,634, \$376,555,801, \$413,543,396, and \$1,471,262,617, respectively. **CONCLUSIONS:** Compared to the non-smokers, the smokers at higher level of risk to COPD caused a heavy economic burden to the society.

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# **HOW MUCH WOULD AMERICA SAVE IF ASTHMA DID NOT EXIST?**

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**OBJECTIVES:** According to data from the National Health Interview Survey, an estimated 22 million Americans had asthma in 2005. Previous estimates of the cost of asthma are outdated; therefore, there is not a clear understanding of the value of resources that are used for asthma care and the loss of productivity to society. This study seeks to estimate the cost of asthma to society in 2006 through evaluating direct medical expenditures and indirect costs. **METHODS:** The expenditure attributable to asthma for health care events (office based visits, emergency department visits, inpatient stays, outpatient visits, and prescription medications) is estimated using the two-step regression technique on 2006 data from the nationally representative Medical Expenditure Panel Survey (MEPS). Work and school absentee days attributable to asthma are estimated using negative binomial regression and are valued following the human capital approach. The authors rely on published estimates for the value of the loss of life from premature death. **RESULTS:** Using data from 2006, having asthma resulted in an estimated additional \$1308 (in 2006 dollars) in direct medical expenditures per person with asthma, of which almost half (\$734) is attributable to prescription medication. Asthma was responsible for an excess of approximately 2.6 school days missed per student with asthma and an excess of approximately 1.7 working days lost per person in the labor force with asthma, costing society an estimated US\$2.3 billion. **CONCLUSIONS:** This paper updates past estimates of the total cost of asthma to society through employing recent data and methods. These estimates may be used to articulate both the monetary burden of asthma and the savings that are achievable when programs aimed at managing asthma are successful at reducing preventable health care utilization.

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# **THE DIRECT ECONOMIC IMPACT OF EXACERBATIONS OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD): A REVIEW OF THE LITERATURE**

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**OBJECTIVES:** To review literature on the medical costs of COPD exacerbations. **METHODS:** A systematic search of the MEDLINE database from 1998–2008 was conducted using the search terms COPD, exacerbation, and economic or cost. Selected conference abstracts were also searched. Articles that contained medical cost data related to COPD exacerbations were selected for in-depth review. **RESULTS:** The initial search criteria yielded 184 journal articles. In-depth review was performed on 13 articles examining health care costs and utilization associated with exacerbations (conceptually defined as sustained worsening of COPD patient's condition from stable state, beyond normal day-to-day variations, with acute onset). These studies were conducted in eight different countries. The mean estimated costs of exacerbations vary widely across studies: \$115 to \$9,060 per exacerbation (2007 US dollars). Hospitalization typically was the largest cost driver (58–77% of total exacerbation cost). Cost was highly correlated with exacerbation severity: severe exacerbations were 7–15 times more expensive than moderate and 47–182 times greater than mild. The wide variability in these cost estimates reflected cross-study differences in geographic locations, patient populations, methodologies for operationally defining exacerbations (e.g., event-based and symptom-based approaches), tools used to identify and measure exacerbations (e.g., symptomatic measures and biological measures), and classification

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of exacerbation severity. In addition, the literature shows that patients frequently suffered from unreported exacerbations to health care providers; these may not be captured in direct cost estimates. **CONCLUSIONS:** Studies of the direct cost of COPD exacerbations show that exacerbations have significant economic impacts. Cost estimates vary widely, and interpretation and application of these cost estimates require an understanding of the different methodologies used to define, identify, and characterize exacerbations.

# **THE WORKPLACE BURDEN OF SMOKING**

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**OBJECTIVES:** To compare the treated disease prevalence, health care costs and utilization, and work-loss, of employees who had never smoked as compared to those who were current smokers. **METHODS:** Three Thomson MarketScan® Research Databases were used: The Commercial Claims and Encounters and Health and Productivity Management (HPM) Databases, providing health care and workplace productivity data for patients insured commercially, and the MarketScan® Health Risk Assessment (HRA) database. HRA data provided information on smoking status. Current versus never smokers were compared in terms of treated medical conditions, health care cost and utilization, and work-loss using bivariate descriptive statistics and regression analyses. Control variables in the regression analyses were age, gender, body mass index, health plan capitation, education, income, and employer characteristics. **RESULTS:** Current smokers had a significantly higher risk for respiratory diseases compared with never smokers (a higher prevalence rate of 1,420 per 100,000,  $p < 0.01$ ). On average, smokers used 1.81 fewer outpatient services per year (from a mean rate of 13.52) ( $p < 0.01$ ), filled 0.48 more prescriptions per year (from a mean rate of 8.63) ( $p < 0.05$ ), and had 0.02 more emergency room visits per year as compared with those who never smoked (mean number of 0.16) ( $p < 0.01$ ). Relative to never smokers, an average smoker had 13.26 more absent hours and 1.47 more short-term disability days per year (the mean number of absence hours was 74.46; the mean of number of short-term disability days was 4.93) (all  $p$  values  $< 0.01$ ). The absence and short-term disability costs of a current smoker was \$282.77 and \$158.40 higher per year, respectively, as compared to a never smoker. **CONCLUSIONS:** Compared to never smokers, current smokers had a significantly higher prevalence of respiratory diseases, used more prescriptions, had more emergency room visits, fewer outpatient services, and incurred more absence hours, short-term disability days, and absence costs.

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# **IMPACT OF APPROPRIATE THERAPY ON ASTHMA-RELATED HEALTH CARE UTILIZATION AND EXPENDITURES IN A MEDICAL POPULATION OF SEVERE ASTHMATIC PATIENTS**

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**OBJECTIVES:** Evaluate whether one-year total health care expenditure and utilization differ between the appropriate therapy and inappropriate therapy for severe asthmatic patients in a Medi-Cal population. **METHODS:** This is a cross-sectional retrospective study of asthmatic patients provided care between July 2002 and July 2006 in the California Medi-Cal program. The study evaluates severe asthmatic patients who had at least one hospitalization due to asthma. Patients were followed for asthma-related health care service use and costs for one year after asthma related hospitalization. Patients under treatment with asthma-related medications for other conditions and/or aged 65 or older were excluded from the sample. Patients were classified in two groups: appropriate and inappropriate therapy based on published guidelines. Appropriate therapy was defined as controller use without daily reliever use and inappropriate therapy was defined as controller use with daily reliever use or no controller use with reliever use. **RESULTS:** A total of 4728 patients were included in the analyses. Multivariate analysis showed that appropriate therapy was associated with a 9% reduction in asthma related health care costs compared with the inappropriate therapy group ( $p$ -value 0.0287). Gender (Male) and race (white and asian compared to Hispanic) were also associated with decreased total health care expenditures. Moreover, patients who received appropriate therapy are less likely (34% less) to have an asthma-related acute exacerbation (OR = 0.664,  $p$ -value  $< 0.0001$ ) compared to those with inappropriate therapy. **CONCLUSIONS:** The findings suggest that the use of appropriate therapy improves the asthma-related health outcomes for severe asthmatic patients. Patients in the appropriate therapy group are less costly and less likely to be hospitalized or have an emergency visit compared to patients who had inappropriate therapy. Despite years of national efforts and effective medications, there is substantial room for improvement and there continues to be excess health care utilization and expenditures for some severe asthma patients.

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